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Longitudinal Changes in Pronoun Reversals in Children with Autism Spectrum Disorder and Typically Developing Children

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Abstract

Pronoun reversals occur when a pronoun is incorrectly mapped to the wrong referent. For example, when a child says, “You eat the cookie!” and intended to state that he is eating a cookie. Children with Autism Spectrum Disorder, ASD, are known to be frequent reversers, but their development of these reversals; for example, incidence rate and endpoint, is still unknown. In this study, children interacted with their mothers in a 30-minute play session and their spontaneous pronoun usage were coded for the perspective of the pronoun, type of reversal, and case errors. Children with ASD to their typically developing (TD) counterparts. Few reversals were produced; however, children with ASD did tend to have a higher percentage of reversals and a larger proportion of first person pronouns at latter visits. Moreover, children with ASD showed a different pattern of reversals, exchanging “I” for “you” more frequently while TD children exchanged “you” for “I” more frequently.

Introduction

Personal pronouns are unique because of their referential fluidity. For example, a pronoun such as "I" can be used to describe various people while the word, "ball," can only be used to describe a single, physical manifestation: a circular sphere. Therefore, pronouns are difficult to learn through rote imitation (Cooley, 1908). Instead, the child must understand that there are different positions that one can hold in a conversation (e.g., speaker, addressee, and non-addressee) and that pronouns change depending on a person's role (Shipley & Shipley, 1969). Moreover, it has been suggested that a child must develop a sense of self and in turn develop a sense of the other in order to understand how to use pronouns (Cruttenden, 1977).

The mental abstractions of another's point of view have also been mapped to a differentiation of spatial views. Loveland (1984) suggested that the ability to view the different spatial points of view is a precursor to understanding the different point of views in speech. In this study, a children aged 1;10 to 3;3 were shown a double-sided picture (e.g., a bird on one side and a bottle on the other side). The researcher then inquired the child, "What does (the child's name) see?" and then asked, "What does the (researcher's name) see?" The study purposely did not use pronouns in asking the prompt questions and found that children who passed the task also produced pronouns correctly (Loveland, 1984). Similarly, Ricard, Girouard, and Gouin-Decarie (1999) used a "cube" task, which had different pictures on each face, such as a dog, and asked the child to show his mother the dog. Children scored correctly if they showed their mother the dog and not face the dog towards himself. Children also engaged in a free play where Ricard and colleagues extracted pronouns from spontaneous speech. Both studies showed that children who

overcome two visual perspectives will produce pronouns correctly soon afterwards (Loveland, 1984; Ricard, et al., 1999). In other words, a child must learn to disregard the egocentric point of view and have the ability to perceive another person's point of view to show mastery of pronouns.

Pronoun Acquisition

Three suggested hypotheses of pronoun acquisition are referred to as ROLE, PERSON, and PERSON-ROLE (Clark, 1978; Charney, 1980). The ROLE hypothesis suggests that children already understand conversation roles and because this ability is in place all pronouns should emerge at the same point in development (Clark, 1978; Charney, 1980). On the other hand, the PERSON hypothesis suggests that children do not have this understanding and often believe that the pronouns refer to a specific person (Clark, 1978; Charney, 1980). Because pronouns are analogous to names in this hypothesis, all pronouns should emerge at the same time; however, some will be used incorrectly at first (Charney, 1980). Finally, the PERSON-ROLE hypothesis supports the notion that children first learn pronouns that refer to their own perspective and then extend that to others' point of views, which suggests that first person pronouns emerge first, then second person pronouns, and then third person pronouns (Charney, 1980).

Findings have been mixed as to which hypothesis epitomizes the acquisition of pronouns, but there is general consensus concerning typically developing children's development of pronouns. Personal pronouns appear around twenty-four months in English learners (Cruttenden, 1977). First person pronouns are believed to be acquired before other pronouns because of children's use of self-reference at the beginning stages of life (Waterman & Shatz, 1982; Imbens-Bailey & Pan, 1998). The acquisition of second

and third person pronouns follows shortly after though no order has been established for second and third person pronouns (Waterman & Shatz, 1982).

Furthermore, Lewis and Ramsay (2004) found that children with more self-recognition produced more pronouns. In his study, he assessed children at three month intervals from ages fifteen to twenty-four months with a visual self-recognition task. In the visual self-recognition task, he applied a red rouge on the child's nose and led the child to the mirror. Self-recognition was scored if the child points to his own nose. The child's pronoun usage was based on parent's report; namely Stipek, Gralinski, and Kopp's (1990) self-concept questionnaire. Regardless the onset of production, it seems that even typically developing children tend to initially confuse first person and second person pronouns (Fay 1979). This confusion is called a pronoun reversal.

Pronoun Reversal

A pronoun reversal occurs when a pronoun is used with the incorrect referent attached. For example, if a child says, "I get the milk," when he intended that his mother get the milk, that would be considered a pronoun reversal. As the example suggests, children who perform pronoun reversals have the tendency of confusing first person and second person pronouns (Cruttenden, 1977). Researchers have proposed that children resolve the confusion by attending to non-directed speech (Oshima-Takane and Benaryoya, 1989).

However, pronoun reversals seem to be rare errors in both typically developing and atypically developing children with the exception of children diagnosed with Autism Spectrum Disorder, ASD (Bol & Kasparian 2009). Moreover, because of the novelty of this error, which seems to be only centered on children with ASD, it has become another

diagnostic tool in determining if a child has autism (Kanner, 1946). This is not to say, however, that only ASD children produce these errors. In fact, first-borns and children with no siblings are also known to be reversers possibly because they lack the exposure to speech between their mother and another sibling (Oshima-Takane, Goodz, & Derevensky, 1996). For example, in child-directed speech, the child is always "you," the addressee and the mother is always "I," the speaker while in non-directed speech, mother and the sibling are both "I," as the speakers and "you," as addressees (Oshima-Takane, et al., 1996; Evans & Demuth, 2012). Therefore, younger siblings may learn pronouns at an accelerated pace through repeated exposure that pronouns are not fixed and rather they are dependent on conversational roles.

In addition, reversers tended to be those children who produce pronouns preemptively without understanding its use (Evans & Demuth, 2012). In one case study of an only child, David, who was typically developing, the child produced up to 94% reversals for first-person pronouns (i.e., "I" intending to be "you") and 100% reversals for second person pronouns (i.e., "you" intending to be "I") at the onset of pronoun reversals (Oshima-Takane, 1992).

The biggest population of reversers, though, is still children with ASD who have been characterized as solitary beings as they often do not seek social interactions or relationships with others. In addition, if they are verbal, their speech is reduced to stereotypes and repetitions (American Psychiatric Association, 1994). Impairments in both the social and language domains pose obstacles in learning personal pronouns. Thus, Kanner (1943) proposed that their reversal rate is due to the prevalence of one of their stereotyped behaviors, namely, echolalia. As previously suggested, rote imitation does

not account for the change in speech roles, and therefore causes trouble for those learning pronouns. In addition, the sense of self and others, learning to disregard egocentricism, and ability engage in joint attention are also important factors in learning how to use personal pronouns, which children with ASD tend to lack (Ricard, et al., 1999). Moreover, children with ASD have difficulty readily distinguishing themselves in a relationship with their conversational partner, which is vital in determining speech roles (Fay 1979; Hobson, Lee, & Hobson 2010). For example, when a child uses a pronoun, he must understand that he as the speaker must be referred to as "I" while his interlocutor or addressee must be referred to as "you." Further, Chiat (1980) concluded that understanding their own, the child's, role in relation to others is crucial to pronoun learning. However, studies did find that children with ASD along with other atypically developing populations (e.g., language impaired, Down's Syndrome, etc.) show a delay in using pronouns rather than a deficit (Lee & Hobson, 1994; Bol & Kasparian, 2009).

Interestingly, Evans and Demuth (2012) found that there were two different patterns of reversals. Their study consisted of two early talkers, one typically developing, TD, child named Naima, and the other was eventually diagnosed with Asperger syndrome, which is a high functioning variation of ASD, named Ethan. The reversal pattern that Naima produced included consistently reversing second person pronouns (e.g., intending "you" to be "I"), which suddenly disappeared at age 2;5. In contrast, Ethan not only reversed second person to first person pronouns, but also first person pronoun to second person (e.g., intending "I" to be "you") and continued to reverse at high rates by the end of the study. But overall, he tended to reverse more second person pronouns than first person pronouns.

Previous studies have reported that more children with ASD reversed more than their typically developing counterparts, but the rate of reversal for both groups is still unknown (Tager-Flushberg 1994; Lee & Hobson 1994; Jordan, 1989). Moreover, these studies have shown that reversals for typically developing children vanish within a year after their appearance in the child's speech while children with ASD's reversal development is still unknown (Oshima-Takane, 1992; Chiat, 1982; Evans & Demuth, 2012; Waterman & Shatz, 1982). In addition, the two different patterns of reversals ("I" for "you" and "you" for "I") found in Evans and Demuth's (2012) study have yet to be replicated.

The current study examines these two questions further. First, the present study investigates the reversal rate for both groups, children with ASD and their typically developing counterparts. Because the previous literature has suggested that children with ASD have low proficiency in understanding pronouns due to various factors (imitation, sense of self, egocentricism, lack of joint attention and social relationships), it is expected that children with ASD will not only produce less pronouns, but also reverse more than their typically developing counterparts. Second, this study observes the reversal patterns for both groups. We anticipate seeing that the children with ASD will show both types of reversals: "I" intending to be "you" and "you" intending to be "I" while the TD children will only show the pattern of "you" intending to be "I." This is expected because these were the same patterns found in Evan and Demuth's (2012) Ethan and Naima. Finally, the present study will also examine the relationship between birth order and reversals. Previous literature has characterized children without siblings and the oldest children of their family to be the "reversers" (Oshima-Takane, et al., 1996; Evans & Demuth, 2012).

Therefore, we suspect that children without siblings and the oldest children of their family will reverse more frequently than children who have older siblings.

Method

Participants

The participants for this data set included 18 typically developing children (TD) and 15 children diagnosed with Autism Spectrum Disorder (ASD), which was confirmed with the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, Goode, Heemsbergen, Jordan, Mawhood & Schopler, 1989) and Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988) as an assessment prior to the beginning of the study. The ASD children were recruited via service providers in New Jersey, New York, Rhode Island, and Massachusetts and included two separate cohorts. All ASD participants were verbal and were receiving at least five hours of Applied Behavioral Analysis therapy (ABA; Lovaas, 1987; Lovaas & Buch, 1997). At the onset of the study, the ASD children ranged from 24.28 months to 42.01 months of age (M = 31.77, SD = 4.75) while TD children ranged from 19.01 months to 24.20 months of age (M = 20.5, SD = 1.7). The participants were visited every 4 months for 6 visits. There were only boys in the ASD group, whereas, the TD group consisted of 16 boys and two girls.

Procedure

The data used for this study were derived from a semi-structured 30-minute mother-child interaction for each visit, where the mother was instructed to openly engage and interact with her child. The play sessions were recorded and transcribed in CLAN. The current study investigated only the child's utterances and from these, only the

utterances with pronouns were extracted for analysis. In addition, utterances, where the child used his/her own name or the mother's name, which in most cases is a form of "mommy," in place of a pronoun were also extracted.

Coding

In the present study, researchers coded for the existence of pronouns, the perspective of the pronoun (first, second, or third person), the pronoun referent, and case errors. Only personal pronouns were included and were limited to variations of singular first person, second person, and third person. First person pronouns included *I*, *me*, *my*, *mine*, *myself*. Second person pronouns included *you*, *your*, and *yours*. Third person pronouns included *he*/*she*, *his*/*her*, and *hers*. Contracted forms were also coded for (eg, *I'm*, *I'll*, *I've*, *you're*, *you've*, *you'll*, *he's*/*she's*, *he'd*/*she'd*, *he'll*/*she'll*) to ensure the child was not using the pronoun as a frozen form.

A reversal came in either one of two forms: a speaker-addressee reversal or a gender reversal. A speaker-addressee reversal entails using a first person pronoun instead of a second person pronoun (eg, "I bring the milk" when the child is requesting his mother to bring the milk). On the other hand, addressee-speaker reversal entails using a second person pronoun instead of a first person pronoun (eg, "You drink the milk" when the child is describing his own action of drinking the milk). For a gender reversal, the child can either reverse in such a way that he uses a masculine third person pronoun for a feminine third person pronoun or he uses a feminine third person pronoun for a masculine third pronoun. Because of the absence of gender reversals in the dataset, these were excluded from final analysis.

The researchers used the context of the transcript to determine if a reversal occurred. If the pronoun was not reversed, it was coded "C" for correct. In contrast, a reversed pronoun was coded "R" for reversed. In addition, "A" was used if the pronoun's referent was ambiguous. Investigators also coded for the intended referent of the pronoun and the verb that immediately followed the pronoun to ensure that a pronoun was not within a frozen form. Furthermore, coders coded for the discourse of the pronoun context. Discourse codes can be found in Appendix 1. Pronouns in utterances that were coded with IMI, REP, COR, REC, FRO, or UNC discourse were excluded from analysis because pronouns in these discourses were considered to be unproductive. All other discourses were considered productive uses of pronouns.

Case errors were coded as categorical, yes or no. A case error was committed when a child used a nominative case in place of an accusative or genitive case (e.g., see I or I ball), accusative in place of a nominative or genitive case (e.g., me see or me ball), genitive in place of a nominative or accusative case (e.g., my see or see my). In the current sample, case errors were rare and so were excluded from analysis.

Analysis

The pronoun uses investigated were number of pronouns produced, percent of first person pronouns, number of reversals, and percent of reversals. All ambiguous pronouns were excluded from analysis. The number of pronouns for each child was expressed by the amount of pronouns that were unambiguous in who or what the referent was. Percentage of first person was examined by the proportion of first person pronouns a child uses in comparison to their total amount of produced pronouns within a given visit. The number of reversals was calculated by the sum of reversals with a definitive referent

switch. Finally, percentage of reversals was the proportion of reversed pronouns to total unambiguous pronouns.

Birth order for each child was also established (Oshima-Takane, et al., 1996). Children were split into two groups: sibling and non-sibling. Children were considered to be in the sibling group if they had an older sibling, which would facilitate pronoun learning. In contrast, children were considered to be in the non-sibling group if they were an only child or had younger siblings.

Reliability Coding

Two researchers were assigned to code for this study. Each coder was assigned to code nine TD children and five ASD children. One of the coders coded an additional five children with ASD to increase the sample size for the children with ASD. Both coders consulted for reliability for one child with ASD to ensure consistency in coding. Disagreements were resolved by discussion.

Results

Number of Pronouns

Table 1 presents the means and standard deviations for number of pronouns for both groups. T-tests between groups at visit one revealed that children with ASD produced significantly more pronouns than TD children; $t(31)= -2.132$, $p = .047$, equal variances not assumed. However, the TD children produced significantly more pronouns than children with ASD at visits 5, $t(31)= 3.057$, $p = .005$, and 6, $t(31)$, $p = .045$.

The number of pronouns produced was correlated with the Mullen Scales of Early Language (Mullen), Vineland Adaptive Behavior Scales (Vineland), Communicative Development Inventory (CDI), Autism Diagnostic Observation Schedule (ADOS), mean

length utterance (MLU). Significant correlations between number of pronouns and standardized scores for TD children and children with ASD were reported on Table 2 and Table 3 respectively. For both groups, children who scored higher on the Mullen, Vineland, CDI, and MLU produced more pronouns than those who scored lower. On the other hand, for the children with ASD, those who scored higher on the CDI Understands produced fewer pronouns. Moreover, children with ASD who scored the higher on the ADOS, and therefore more autistic, produced fewer pronouns.

Proportion First Person Pronouns

Table 4 presents the proportion of first person pronouns to total usage of pronouns for both groups. A between groups t-test revealed that at visit six, children with ASD produced a higher percentage of first person pronouns than TD children; $t(31)= -2.210$, $p = 0.035$.

Table 5 and Table 6 present the significant correlations between the proportion of first person pronouns and standardized scores for TD children and children with ASD respectively. For both groups, children who scored higher on the Mullen, Vineland, and CDI were the same children who had a lower proportion of first person pronouns at visit 6. Similarly, TD children with higher MLUs produced a lower proportion of first person pronouns at visits 4, 5, and 6.

Number of Reversals

Children across both groups produced few reversals (see Table 7). However, children with ASD and TD children showed different patterns in their types of reversals. A marginally significant group effect was found at visit 2, where children with ASD produced more “I” intending to be “you” reversals while their TD counterparts produced

more "you" intending to be "I" reversals, X^2 (1, N =6) = 3.00 p = .083. The same, now significant, pattern was found in visits 3 and 4 where children with ASD reversed more first person pronouns ("I" intending to be "you") while TD children reversed more second person pronouns ("you" intending to be "I"), X^2 (1, N =23) = 9.76, p = .002 and X^2 (1, N =33) = 6.07, p = .014 respectively.

Table 8 and Table 9 present significant correlations between number of reversals and standardized scores for the TD children and children with ASD respectively. For both groups, children who scored higher on the ADOS, (i.e., more autistic), reversed more than those who scored lower. Moreover, the TD children who scored higher on the Vineland, and CDI produced fewer reversals.

Proportion of Reversals

Like the amount of reversals, the proportion of reversals was low for both ASD and TD groups as presented in Table 10. At visits 5 and 6, marginally significant group differences were found such that the ASD children tended to produce a higher percentage of reversals than their TD counterparts; t(31)= -2.085, p= .057, equal variances not assumed and t(31)= -1.908, p = .079, equal variances not assumed respectively.

Table 11 and Table 12 present the significant correlations between proportion of reversals and standardized scores for TD children and children with ASD respectively. For both groups, children with a higher ADOS scores reversed at a higher proportion. Similarly, for both groups, children who scored higher on their Vinelands reversed at a lower proportion. Furthermore, the TD children who had higher MLUs and CDI produced a lower reversal proportion.

Without Third Person Pronouns

In the previous t-tests, we included first, second, and third person pronouns, but the aim of the study was to observe speaker-addressee reversals, which includes only first and second person pronouns. In terms of number of pronouns, we observed that at visit 1, children with ASD produced significantly more pronouns than TD children, but by visits 5 and 6, TD children produced significantly more pronouns than children with ASD. For proportion of first person pronouns, we examined first person pronouns in proportion to overall pronouns (first, second, and third) and discovered that children with ASD produced a higher proportion of first person pronouns at visit 6. We found no significance in reversals, but we did find at visits 5 and 6, there were marginal group differences between children with ASD and TD children. That is that the children with ASD reversed a higher proportion than TD children.

By using third person pronouns, we add noise to the amount of pronouns produced, which affects the proportion of first person pronouns, and reversals, which affects the proportion of reversals. Reversals were affected because a handful of third person reversals (i.e., gender reversals) were included for analyzes, but was only found in one child at one visit. Because of the lack of reversals that the study observed, the handful of third person reversals may have skewed the results. Therefore, independent t-tests between groups were also examined without third person pronouns.

At visit 1, children with ASD produced more first and second pronouns than TD children, $t(31)= -2.188$, $p = .042$, equal variances not assumed. By visit 4, TD children tended to produce more first and second pronouns than children with ASD, $t(31)= 1.843$, $p = .075$, equal variances not assumed, but by visit 5, TD group produced significantly more pronouns than the ASD group, $t(31)= 3.190$, $p = .003$, equal variances not assumed.

Moreover, at visit 5, children with ASD also reversed significantly more and at a higher proportion than their TD counterparts, $t(31)= -2.202$, $p = .035$ and $t(31)= -2.443$, $p = .043$, equal variances not assumed, respectively. Similarly, at visit 6, children with ASD tended to reverse more than TD children, $t(31)= -1.892$, $p = .068$.

Unlike our results with third person pronouns, we found that TD children start diverging away from children with ASD by visit 4 and only showed a significant group difference at visit 5 and no longer significantly producing more pronouns at visit 6 as found in our results with third person pronouns. Moreover, we no longer find effects of proportion of first person pronouns, which may be because of TD children's usage of more third person pronouns at visit 6. Furthermore, with third person reversals, we found no group differences in amount of reversals, but without the third person reversals, we found that, at visit 5, children with ASD did produce more reversals than their TD counterparts. Finally, with third person reversals, we found only marginal differences at visits 5 and 6, but by excluding the third person reversals, we found that children with ASD tended to reverse more than TD children at visit 5 and by visit 6, the difference became marginal.

Structured Versus Non-Structured

The interaction between mother and child involved two distinct sections: structured and non-structured. The structured portion of the session involved the investigators instructing the mother to engage their child in certain tasks such as book reading, tower building, decision making, and balloon/bubble blowing. In contrast, the instructions for the non-structured portion of the session consisted of the mother interacting with her child as if it were a typical, everyday play session. Chi-squares for

reversals in structured versus non-structured portions revealed that children reversed more in the structured play than the non-structured play, X^2 (1, N =15) = 6.57, p = .010.

Birth Order

No group differences (TD versus ASD) nor subgroup differences were found (with versus without siblings) were found.

Discussion

The purpose of this study was to examine the pattern of pronoun reversal rates across time for children with ASD compared with TD children to determine if children with ASD engage in the same developmental pattern in reversal dropping as TD children. Moreover, the present study examined differences in reversal patterns in both groups.

Number of Pronouns

The present study observed that at the first visit, children with ASD produced more pronouns than their typically developing counterparts. This is suspected to be because children with ASD were chronologically older by eleven months at the onset of the study. However, as the study progressed, TD children surpassed children with ASD in production of pronouns. This supports previous literature that proposed that children with ASD have a delay in language growth while their typically developing counterparts experience a language spurt (Lee & Hobson, 1994). Moreover, the study demonstrated that the delay of pronoun production is related to the severity of autism as well as their cognitive functioning as emphasized by their ADOS and other standardized scores (e.g., Mullen, Vineland, and CDI).

Another interesting finding was the relationship between “CDI Understands” and pronoun production found only for children with ASD, where, the children with ASD

who scored higher on "CDI Understands," also produced less pronouns. "CDI Understands" is a parent-reported survey that tries to unpack what words parents believe their children understand. I believe that this finding supports that a parent's intuition of what their child understands may be biased, especially the parents of children with ASD. Perhaps, this is because the parents of children with ASD realize the stigma that is associated with ASD and tries to bolster their child's improvement for their own gratification so that they would rank their child's understanding to be greater than what it truly is.

First Person Pronouns

For this study, we attempted to measure egocentrism via first person pronouns because previous studies agreed that children with ASD are more egocentric than their typically developing counterparts as postulated by the DSM IV. (Ricard, et al., 1999; American Psychiatric Association, 1994; Fay, 1979; Hobson, Lee, & Hobson, 2010; Lee & Hobson, 1994). However, as demonstrated from this study, children of both groups tended to produce a high proportion of first person pronouns, and therefore, both groups are egocentric. Yet in spite of this finding, this study also observed that children with ASD continued to display egocentrism while the TD children showed a gradual decline, which is displayed in their proportion of first person pronouns. In the beginning of the study, TD children spiked to about 86% of first person pronouns, however, by the end of the study, they are reduced to 58% of first person pronouns. In contrast, children with ASD also spiked to 81% at the early visits, but produces 70% first person pronouns at visit 6. But because of correlations found between higher cognitive functioning and producing a smaller proportion of first person pronouns, it is possible that this domain

may also be a delay of decreasing egocentrism rather than a deficit. Another interpretation of these findings is that those that are more on the spectrum (i.e., lower functioning) are more egocentric as displayed.

Though it may seem as though egocentrism is a "bad" quality, the plethora of first person pronouns seem to highlight that the children with ASD do not seem echolalic. As previously discussing, Kanner (1943) claims that children with ASD have a more difficult time learning pronouns than TD children because children with ASD are imitative in their speech. Smiley, Chang, and Allhoff (2011) found that parents use "you" more frequently than "I." If children with ASD were entirely echolalic, it would be predicted that children with ASD would produce more second person pronouns because of the constant "you" input that they received. But on the contrary, the current study examines that children with ASD produced a high proportion of first person pronouns, and furthermore, most of the pronouns produced were used productively.

Reversals

The previous literature promoted the hypothesis that children with ASD would produce more pronoun reversals (Fay, 1979; Hobson, Lee, & Hobson, 2010; Lee & Hobson, 1994; Tager-Flusberg, 1994; Oshima-Takane and Benaroya, 1989). However these studies examined children for both groups who had previously been known to reverse pronouns while the present study extracted a random population from both groups. The current study found that both populations reverse, but at a very low rate, whereas, previous studies have reported anywhere from 85% to 100% (Evans & Demuth, 2012; Chiat, 1982). We did observe, however, that two-or-three children in each groups committed most of the reversals, but a different subset of children per visit. Moreover, we

examined those who reversed the most per visit and found that most reversals were committed in a structured setting. It may be possible that this finding emerged from the mother actively engaging with the child in a task and may have provided more opportunities to reverse.

In the current study, we found that children with ASD had at greater tendency to reverse more with a maximum of 8%, while their typically developing counterparts reversed a maximum of 3%. This finding is at odds with previous studies, which have stated that children with ASD reversed tremendously more than TD children (Fay 1979). But it is important to note that children with ASD did continue to reverse by the end of the study, whereas, the TD children who stopped generally entirely by visit 6. Similarly Evans and Demuth (2012) also demonstrated with their TD child, Naima.

In juxtaposition, previous studies have supported the notion that children with ASD acquired pronouns differently than TD children, which suggests that their pattern of reversals is also different (Fay, 1979; Hobson, Lee, & Hobson, 2010; Lee & Hobson, 1994). However, Evans and Demuth (2012) observed that both Naima and Ethan produced the same pattern of reversals, "you" for "I." Thus, the study aimed to address whether both groups have a different pattern of reversal or the same. Despite, Evans and Demuth's (2011) findings, we anticipated that there would be differences in the pattern of reversal because the amount of literature that has alluded to differences in children with ASD's pronoun production.

In the current study, we found that children with ASD exhibited a different reversal pattern than TD children. As we expected, TD children displayed a pattern of "you" to "I" reversal as other previous literature also has observed in TD children (Evans

& Demuth, 2011; Oshima-Takane, 1992; Chiat, 1982). This is consistent with Clark's (1978) ROLE hypothesis that children have the tendency to map pronouns like names such that "you" becomes another name for the child. On the other hand, children with ASD displayed a pattern of "I" to "you" reversal, which was not observed in Evans and Demuth's (2012) Ethan, who eventually was diagnosed with Asperger Syndrome.

I formulated two possible interpretations for the observed difference in reversals between the current study's sample and Evans and Demuth's (2012). The first interpretation is when the children were diagnosed with their disorder. In the present study, children were diagnosed prior to the onset of the study and re-evaluated again at the first visit of the study to reconfirm the diagnosis. On the other hand, Ethan was diagnosed at age five, which is almost two years after the study concluded. It could be a possibility that Ethan at the time of the study "typically developing" and so, he showed the same trend as a TD child. Whereas, the children with ASD in the present study had been diagnosed and rediagnosed to ensure they were on spectrum and so, displayed a trend unique to those with ASD.

The second interpretation of the difference is the diagnosis itself. Children in the current study were diagnosed with Autism Spectrum Disorder while Ethan was diagnosed with Asperger's Syndrome, which alludes to a possible fundamental difference between ASD and Asperger's Syndrome. In fact, Planche and Lemonnier (2012) claims that children with Asperger's Syndrome show no delay in language while their high functioning ASD counterparts do, but both groups show impairments in the social domain. This claim leads to an interpretation of the findings as more of a language problem than a pronoun problem. If it were a pronoun problem, social relationships and

in turn speech roles would be involved in reversals, which would predict a similar trend for both children with ASD and children with Asperger's Syndrome. In the present study, children with ASD that reversed "I" to "you" also used "you" correctly in most cases, which is evidence that they have "pretty good" knowledge of these pronouns. It is possible that children with ASD tend to overuse "I" and produce these pronoun reversals are because they use "I" as a default pronoun, which shows that children with ASD may not fully grasp what each pronoun's function is.

Limitations and Future Studies

The current study has several limitations. One such limitation originates from our participants. Because of the purpose of the study was to observe pronoun production, investigators collected spontaneous speech from children with ASD who were verbal and produced pronouns by the sixth visit and in turn, collected utterances from those who were higher functioning. Therefore, the study cannot make generalizations to the outcomes of all children with ASD and is limited to only higher functioning children with ASD. Future studies may generalize to lower functioning children with ASD via comprehension tasks as performed by Lee and Hobson (1994) and Loveland (1984).

In addition, the study was limited by the task itself. The task involved an interaction between only the mother and child and rarely included others, which restricted the child to using mainly first person and second person pronouns. Future studies may examine the use of plural pronouns. For example, a study may observe the distinction between "we," a collective and therefore more "social" pronoun, versus "they," a pronoun that separates the child from their conversational partners, in children with ASD and TD children. Moreover, future studies can also address possible gender reversals.

The present study did find several gender reversals in a child with ASD when a third conversational partner, his toy truck, which he proclaimed was male, was included. For example, the child would incorrectly say, “She is a boy!”

The current study also found reversals in animacy. One child with ASD, investigators found that he reversed an inanimate object with a third person pronoun such that the mother noted that the bear in the book has buttons on his shirt and the child says, “But I don’t have any of him.” The third person pronoun appeared to be in reference to the buttons. Again, the sample did not allow many opportunities for third person pronouns to be produced and thus these reversals were minimal and were marked as ambiguous, which were later excluded from analysis.

One aspect that we have yet to uncover is whether the developmental curve of pronoun reversals for children with ASD is similar to that of TD children. That is, do their reversals disappear abruptly, or never disappear entirely? At the end of the current study, children with ASD continued to reverse while TD children’s reversals had declined greatly. Investigators anticipate that children with ASD often show delays rather than deficits that in a longer longitudinal study, the children with ASD’s reversal rate will also vanish.

While the study aimed to create a general baseline for reversals in children with ASD, it failed to do so. Instead, it added to the various percentages of reversal rates that have been associated with children with ASD. However, the study did show a radically different proportions of reversals than previous studies have suggested and added to the plethora of results that children with ASD suffer from a delay of acquisition and not a deficit.

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Appendix 1.

Context	Code	Description	Example
Imitation	IMI	Pronoun is used in a full, partial, shortened imitation within five lines.	MOT: I haven't. CHI: no. CHI: I haven't.
Repetition	REP	Pronoun is used in an immediate repetition.	CHI: I want. CHI: I want a ball.
Correction	COR	Pronoun is used as an error, but corrected with another pronoun.	CHI: I you get the ball.
Request	REQ	Pronoun is used in a form of a request.	CHI: help me open this.
Recitation	REC	Pronoun is used in a rehearsed line from a book, song, etc.	CHI: how I wonder where you are
Personal	PER	Pronoun is used to describe what the speaker is doing.	CHI: and I eat the whole thing!
Play	PLAY	Pronoun is used in the conversation to toys.	CHI: we could put you to sleep.
Description	DES	Pronoun is used to discuss someone or something else's actions.	CHI: he's not gonna wake up to play
Frozen	FRO	Pronoun is used as a frozen expression	CHI: thank you.
Unclear	UNC	Pronoun is used with the referent being unclear	CHI: from the car. CHI: you're a little.
Other	OTH	Pronoun is used in any other discourses.	CHI: he's a little baby elephant.

Table 1.

	Number of Pronouns					
	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6
TD (N=18)						
M	3.22	14.22	37.61	57.06	71.83	70.72
SD	6.839	14.819	31.960	36.610	29.841	25.811
ASD (N=15)						
M	12.60	23.67	35.33	35.07	36.86	38.86
SD	15.851	32.533	35.245	32.281	34.855	42.009

Table 2.

TD Children's Correlations for Number of Pronouns			
Number of PNs Visit #	Standardized Test and MLU	r-value	p-value
V2 Number of PNs	V1 Mullen Expressive Language	.573	.013
V2 Number of PNs	V1 CDI Total Says and Understands	.496	.036
V2 Number of PNs	V1 Mean Length Utterance	.580	.012
V3 Number of PNs	V1 Mullen Visual Reception	.511	.030
V3 Number of PNs	V1 Mullen Expressive Language	.611	.007
V3 Number of PNs	V1 Mullen Early Learning Composite	.719	.001
V3 Number of PNs	V1 CDI Total Says and Understands	.597	.009
V3 Number of PNs	V1 Mean Length Utterance	.594	.009
V3 Number of PNs	V2 Mean Length Utterance	.703	.001
V3 Number of PNs	V2 CDI Total Words	.733	.001
V4 Number of PNs	V2 Mean Length Utterance	.644	.004
V4 Number of PNs	V3 CDI Total Words	.530	.024
V5 Number of PNs	V1 Mullen Fine Motor	.554	.017
V5 Number of PNs	V4 Mean Length Utterance	.507	.032

Table 3.

Children with ASD's Correlations for Number of Pronouns			
Number of PNs Visit #	Standardized Test and MLU	r-value	p-value
V2 Number of PNs	V1Mullen Receptive Language	.638	.010
V2 Number of PNs	V1 Expressive Language	.744	.001
V2 Number of PNs	V1 Early Learning Composite	.653	.008
V2 Number of PNs	V1 CDI Total Understands	-.537	.039
V2 Number of PNs	V1 Mean Length Utterance	.857	.000
V3 Number of PNs	V1 Mullen Visual Reception	.567	.027
V3 Number of PNs	V1 Mullen Receptive Language	.616	.015
V3 Number of PNs	V1 Expressive Language	.747	.001
V3 Number of PNs	V1 Early Learning Composite	.680	.005
V3 Number of PNs	V1 Vineland Communication	.743	.002
V3 Number of PNs	V1 CDI Total Says and Understands	.701	.004
V3 Number of PNs	V1 CDI Total Understands	-.674	.006
V3 Number of PNs	V2 CDI Total Words	.678	.005
V3 Number of PNs	V5 CDI Total Level 3 Words	.684	.010
V3 Number of PNs	V1 Mean Length Utterance	.869	.000
V3 Number of PNs	V2 Mean Length Utterance	.900	.000
V4 Number of PNs	V1 Expressive Language	.778	.001
V4 Number of PNs	V1 Early Learning Composite	.768	.001
V4 Number of PNs	V1 Vineland Communication	.839	.000
V4 Number of PNs	V3 Vineland Communication	.774	.001
V4 Number of PNs	V1 CDI Total Says and Understands	.862	.000
V4 Number of PNs	V1 CDI Total Understands	-.649	.009
V4 Number of PNs	V2 CDI Total Words	.806	.000
V4 Number of PNs	V5 CDI Total Level 3 Words	.772	.002
V4 Number of PNs	V1 Mean Length Utterance	.851	.000
V4 Number of PNs	V2 Mean Length Utterance	.852	.000
V4 Number of PNs	V3 Mean Length Utterance	.824	.000
V4 Number of PNs	V1 Mullen Receptive Language	.711	.003
V4 Number of PNs	V1 Mullen Visual Reception	.648	.009
V5 Number of PNs	V1 Mullen Receptive Language	.699	.004
V5 Number of PNs	V1 Expressive Language	.830	.000
V5 Number of PNs	V1 Early Learning Composite	.785	.001
V5 Number of PNs	V1 Vineland Communication	.793	.000
V5 Number of PNs	V2 Vineland Communication	.533	.032
V5 Number of PNs	V3 Vineland Communication	.647	.009
V5 Number of PNs	V1 CDI Total Says and Understands	.663	.007
V5 Number of PNs	V1 CDI Total Understands	-.613	.015
V5 Number of PNs	V2 CDI Total Words	.741	.002
V5 Number of PNs	V3 CDI Total Words	.580	.023
V5 Number of PNs	V4 CDI Total Level 3 Words	.679	.022
V5 Number of PNs	V1 Mean Length Utterance	.677	.006
V5 Number of PNs	V2 Mean Length Utterance	.795	.000
V5 Number of PNs	V3 Mean Length Utterance	.646	.009

V5 Number of PNs	V4 Mean Length Utterance	.773	.001
V5 Number of PNs	V1 Mullen Visual Reception	.691	.004
V6 Number of PNs	V1 Mullen Visual Reception	.618	.014
V6 Number of PNs	V1 Mullen Receptive Language	.578	.024
V6 Number of PNs	V1 Expressive Language	.764	.001
V6 Number of PNs	V1 Early Learning Composite	.707	.003
V6 Number of PNs	V1 Vineland Communication	.782	.001
V6 Number of PNs	V3 Vineland Communication	.656	.008
V6 Number of PNs	V5 Vineland Daily Living	.526	.044
V6 Number of PNs	V1 CDI Total Says and Understands	.723	.002
V6 Number of PNs	V1 CDI Total Understands	-.695	.004
V6 Number of PNs	V2 CDI Total Words	.703	.003
V6 Number of PNs	V4 CDI Total Level 3 Words	.736	.010
V6 Number of PNs	V5 CDI Total Level 3 Words	.778	.002
V6 Number of PNs	V1 Mean Length Utterance	.790	.000
V6 Number of PNs	V2 Mean Length Utterance	.798	.000
V6 Number of PNs	V3 Mean Length Utterance	.715	.003
V6 Number of PNs	V4 Mean Length Utterance	.690	.004
V6 Number of PNs	V5 Mean Length Utterance	.577	.024
V6 Number of PNs	V5 ADOS	-.725	.012

Table 4.

Proportion of First Person Pronouns						
	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6
TD (N=18)						
M	.67	.86	.78	.65	.59	.58
SD	.399	.165	.143	.160	.096	.139
ASD (N=15)						
M	.50	.82	.72	.66	.64	.70
SD	.375	.185	.202	.217	.176	.161

Table 5.

TD Children's Correlations for Proportion of First Person			
Percent First Person Visit #	Standardized Test and MLU	r-value	p-value
V4 Proportion First Person	V2 CDI Total Words	-.486	.048
V4 Proportion First Person	V2 Mean Length Utterance	-.514	.029
V4 Proportion First Person	V3 CDI Total Words	-.546	.019
V4 Proportion First Person	V3 Mean Length Utterance	-.566	.014
V5 Proportion First Person	V3 CDI Total Words	-.469	.050
V5 Proportion First Person	V4 Mean Length Utterance	-.528	.024
V6 Proportion First Person	V4 Mean Length Utterance	-.472	.048

Table 6.

Children with ASD's Correlations for Proportion of First Person			
Proportion First Person Visit #	Standardized Test and MLU	r-value	p-value
V3 Proportion First Person	V2 Vineland Daily Living	-.540	.038
V5 Proportion First Person	V4 CDI Total Level 3 Words	-.763	.006
V6 Proportion First Person	V1 Mullen Receptive Language	-.698	.008
V6 Proportion First Person	V1 Vineland Communication	-.665	.013
V6 Proportion First Person	V1 Vineland Socialization	-.556	.048
V6 Proportion First Person	V3 Vineland Communication	-.702	.007
V6 Proportion First Person	V1 CDI Total Says and Understands	-.561	.046
V6 Proportion First Person	V3 CDI Total Words	-.029	.029

Table 7.

	Number of Reversals					
	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6
TD (N=18)						
M	.17	.06	.67	.61	.39	.17
SD	.707	.236	.970	.979	.778	.383
ASD (N=15)						
M	.53	.20	1.07	1.60	1.14	.47
SD	.990	.414	1.387	2.293	1.460	.743

Table 8.

TD Children's Correlations for Number of Reversals			
Number of Reversal Visit #	Standardized Test and MLU	r-value	p-value
V2 Number of Reversals	V1 ADOS	.686	.002
V2 Number of Reversals	V1 Vineland Daily Living	-.470	.049
V2 Number of Reversals	V1 Vineland Daily Living	-.778	.000
V4 Number of Reversals	V1 ADOS	.516	.028
V6 Number of Reversals	V3 Vineland Communication	-.496	.037
V6 Number of Reversals	V4 Vineland Communication	-.488	.040
V6 Number of Reversals	V4 CDI Total Level 3 Words	-.526	.025

Table 9.

Children with ASD's Correlations for Number of Reversals			
Number of Reversals Visit #	Standardized Tests and MLU	r-value	p-value
V6 Number of Reversals	V5 ADOS	.726	.011

Table 10.

	Proportion of Reversals					
	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6
TD (N=18)						
M	.03	.00	.02	.01	.01	.00
SD	.079	.005	.036	.026	.010	.005
ASD (N=15)						
M	.07	.03	.06	.07	.06	.01
SD	.156	.088	.121	.116	.089	.023

Table 11.

TD Children's Correlations for Proportion of Reversals			
Percent Reversal Visit #	Standardized Test and MLU	r-value	p-value
V2 Proportion Reversal	V1 ADOS	.686	.002
V2 Proportion Reversal	V1 Vineland Daily Living	-.470	.049
V2 Proportion Reversal	V1 Vineland Motor Skills	-.778	.000
V6 Proportion Reversal	V4 CDI Total Level 3 Words	-.485	.041
V6 Proportion Reversal	V5 Mean Length Utterance	-.534	.022

Table 12.

Children with ASD's Correlations for Proportion of Reversals			
Proportion Reversal Visit #	Standardized Tests and MLU	r-value	p-value
V3 Proportion Reversal	V2 Vineland Daily Living	-.540	.038
V6 Proportion Reversal	V5 ADOS	.733	.010